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Teachers' Retirement System, State of Montana actuarial evaluation as of July 1

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TEACHERS' RETIREMENT SYSTEM

STATE OF MONTANA

ACTUARIAL VALUATION

AS OF JULY 1, 1985

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SECTION I

INTRODUCTION

An actuarial valuation of the Teachers' Retirement System of the State of Montana has been completed as of July 1, 1985. This valuation was authorized by the Teachers' Retirement Board under Section 19-4-203, M.R.C. The purpose of the valuation was to determine the financial position of the fund, the normal cost, and the unfunded accrued liability based upon present and prospective assets and liabilities of the system as of July 1, 1985.

Section II presents an analysis of the results of the actuarial valuation. The numerical findings and membership data supporting this analysis are shown in Section III.

In conducting the actuarial valuation, certain assumptions were made as to the future experience of the system. A summary and discussion of each of the assumptions is contained in Section IV.

The valuation is based upon the Teachers' Retirement Act and incorporates all amendments as of July 1, 1985. A summary of the major provisions of the Act is contained in Section V.

ACTUARIAL CERTIFICATION

Based upon the assumptions stated in this report and the employee data and other records provided by the Teachers' Retirement System, the actuarial valuation contained in this report has been performed in accordance with generally accepted actuarial principles and techniques.

Alton P. Hendrickson
Member, American Academy
of Actuaries

SECTION II

ANALYSIS OF VALUATION

Summary of Findings

An actuarial valuation of the Montana Teachers' Retirement System was conducted as of July 1, 1985. This valuation concluded that the system is funded on an actuarially sound basis. The total contribution rate of 14.472% of salaries is sufficient to finance the cost of benefits as they accrue in the future as well as to amortize the current unfunded liability over a period of 37.55 years. The previous actuarial valuation on July 1, 1983 determined that the unfunded liability would be amortized over a period of 40.25 years. The decrease in the amortization period is largely attributable to a change in the actuarial assumptions used in the current valuation.

The employer contribution rate was changed from 7.320% to 7.428% as of July 1, 1985, increasing the total statutory contribution rate to 14.472%. This increase was required to fund the cost of benefit increases granted to retired members.

The liabilities of the system have increased since July 1, 1983. The additional liabilities resulted from an increase in the covered payroll as well as increased benefits to retired members. During the same period, the assets increased by approximately 1/3. The specific effects of the actual experience over anticipated experience are discussed below for active and inactive members.

Actuarial Assumptions

As part of the actuarial valuation of July 1, 1985, the applicable assumptions were reviewed and compared with past experience. This review and comparison determined that a change in several of the assumptions was warranted. In particular, the long-term annual investment rate assumption was increased from 7% to 8%. This change was made in light of the current investment return on the system's funds as well as anticipated returns in future years.

The future salary increase assumption was increased in conjunction with the investment rate assumption change. Historically, investment earnings and cost-of-living increases have held at a relatively constant spread on a long-term basis. Although cost-of-living indices have not increased substantially in the last several years, the cost-of-living assumption was set at 6.5% in anticipation that investment earnings and cost-of-living increases will follow a historical trend.

The mortality rates were changed to reflect a national trend of increased longevity. This change was accomplished by setting the ages back on the mortality rates one year.

A change was also made in the retirement rate assumption. The number of retirees in the last few years has been significantly higher than in the preceding eight years. In order to properly recognize the liabilities for members electing early retirement, the probability of retirement at each age was increased 5%.

The net effect of the actuarial assumption changes was a decrease in the total liability by 5.2%. The unfunded liability was decreased 5.9% from $594,483,290 before the changes to $559,132,131 after the changes. The funding position was affected by reducing the amortization period of the unfunded liability from 40.64 years before the changes to 37.55 years after the changes.

Valuation of Active Members

The number of active members grew from 14,243 in 1983 to 14,989 in 1985, representing a 5.2% increase. In the same period, the payroll grew from $293,239,064 to $330,241,152. This represented a 12.6% increase. The average salary grew from $20,588 to $22,032.

The present value of benefits for active members increased from $777,759,735 in 1983 to $844,771,503 in 1985. The liability was increased 14.6% because of the increased payroll. This was offset by a 5.5% decrease in liabilities because of the change in the actuarial assumptions, resulting in 8.6% net change.

The average age of active members of the Teachers' Retirement System is 39.7 years, the average completed service is 9.8 years, and the average salary is $22,032.

Valuation of Inactive Members

The number of members receiving benefits grew from 5,172 in 1983 to 5,672 in 1985. During the same period, the annual benefits grew from $28,001,676 to $36,895,176 representing a 31.8% increase. The liability for inactive members grew from $263,743,569 in 1983 to $337,169,990 in 1985. The liabilities increased 34.5% due to increased benefits, which were offset 5.2% by a change in the actuarial assumptions, resulting in a net change of 27.8%.

The average age of members receiving benefits is 70.5 years. The average number of years worked prior to retirement is 25.4 years and the average monthly benefit being paid is $542.

General

During the biennium, the assets grew from $291,844,682 to $390,093,608, representing a 33.7% increase. This increase is the result of contributions to the system as well as investment earnings. The liabilities of the system also increased during the biennium, but the growth in the assets allowed the system to continue to be well funded.

A thorough review was made of the data provided by the Teachers' Retirement System. This review included an examination for completeness and reasonableness. It was concluded that the data maintained is very complete and accurate. A detailed summary of this data is illustrated in Section VI of this report. The active members have been categorized by full-time and part-time members in order to prevent any distortion of the average salaries.

From an actuarial standpoint, the Teachers' Retirement System appears to be well-managed. The system's liabilities are being funded in a manner which will allow the unfunded liability to be funded in less than 40 years; investment earnings on assets remain high; and the accounting and record keeping systems provide complete and accurate data.

SECTION III

SCHEDULE 1

NORMAL COST ALLOCATION

(1)	Normal Cost Contribution Rate:	
	(a) Retirement	6.071%
	(b) Disability	0.264
	(c) Survivors	0.340
	(d) Vested Terminations	0.328
	(e) Withdrawals	1.669
	(f) Total Rate	8.672%
(2)	Present Value of Future Salaries Of Current Members	$2,683,530,369
(3)	Normal Cost Contribution Rate	8.672%
(4)	Present Value of Future Normal Costs For Current Members (1(f) * (2))	$ 232,715,754

SCHEDULE 2

PRESENT VALUE OF BENEFITS

(1)	Present Value of Benefits - Inactive Members	
	(a) Retirement	$ 297,522,193
	(b) Disability	11,338,805
	(c) Survivors	14,098,256
	(d) Vested Terminations	9,720,870
	(e) Withdrawals	2,706,623
	(f) Tax Sheltered Annuity	1,720,523
	(g) Excess Interest Payment	62,720
	(h) Total Inactive	$ 337,169,990
(2)	Present Value of Benefits - Active Members	
	(a) Retirement	$ 676,039,063
	(b) Disability	15,974,264
	(c) Survivors	27,869,812
	(d) Vested Terminations	22,010,548
	(e) Withdrawals	100,834,178
	(f) Tax Sheltered Annuity	1,985,136
	(g) Legacy Fund	58,502
	(h) Total Active	$ 844,771,503
(3)	Total Liabilities	$1,181,941,493

SCHEDULE 3

CONTRIBUTION AND LIABILITY ALLOCATIONS

(1)	Unfunded Accrued Liability	
	(a) Present Value of Benefits	$ 1,181,941,493
	(b) Present Value of Future Normal Costs	232,715,754
	(c) Fund Assets	390,093,608
	(d) Unfunded Liability (a)-(b)-(c)	$ 559,132,131
(2)	Contribution Rates Amortized over 40.00 Years	
	(a) Present Value of Salaries During Next 40.00 Years	$10,110,377,712
	(b) Unfunded Contribution Rate 1(d)/2(a)	5.530%
	(c) Normal Cost Rate	8.672%
	(d) Total Funding Rate	14.202%
(3)	Contribution Rates Amortized over 37.55 Years	
	(a) Present Value of Salaries During Next 37.55 Years	$ 9,640,209,155
	(b) Unfunded Contribution Rate 1(d)/3(a)	5.800%
	(c) Normal Cost Rate	8.672%
	(d) Total Funding Rate	14.472%

SCHEDULE 4

VALUATION COMPARISON

	1984	1985
Present Value of Total Benefits		
Total	$1,041,159,207	$1,181,941,493
Average for All Members	53,627	57,206
Unfunded Past Service Liability		
Total	$ 519,174,525	$ 559,132,131
Average for All Members	26,741	27,062
Assets		
Total	$ 291,844,682	$ 390,093,608
Average for All Members	15,032	18,881
Present Value of Accrued Benefits		
Vested Benefits	$ 596,865,662	$ 762,855,401
Nonvested Benefits	11,408,999	19,923,568
Total Benefits	$ 608,274,661	$ 782,778,969
Normal Contribution Rate	8.593%	8.672%
Recommended Contribution Rate for Unfunded Past Service Liability	5.798%	5.800%
Total Recommended Contribution Rate	14.391%	14.472%

SCHEDULE 5

COMPARISON OF CONTRIBUTING MEMBERS

	1983	1985
Number of Lives	14,243	14,989
Annual Salaries	$293,239,064	$330,241,152
Average Annual Salaries	$ 20,588	$ 22,032

SCHEDULE 6

COMPARISON OF MEMBERS RECEIVING BENEFITS

	1983	1985
Number of Lives		
Retired	4,665	5,136
Disabled	227	235
Survivor	280	301
Total	5,172	5,672
Annual Benefit Payments		
Retired	$25,757,109	$34,263,876
Disabled	1,053,651	1,203,780
Survivor	1,190,916	1,427,520
Total	$28,001,676	$36,895,176
Average Monthly Benefit Payments		
Retired	$460	$556
Disabled	386	427
Survivor	354	395
Total	$451	$542

SCHEDULE 7

MEMBERSHIP DISTRIBUTION

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Disabled Members	17
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TABLE 1

NUMBER OF FULL-TIME MEMBERS

COMPLETED YEARS OF SERVICE	UNDER 25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	OVER 65	TOTAL
0-4	226	1187	784	747	404	183	98	31	18	1	3679
5-9		313	981	748	481	239	110	59	24	5	2960
10-14			380	1059	543	300	166	88	24	9	2569
15-19				351	800	421	248	143	57	9	2029
20-24				1	196	388	243	127	52	7	1014
25-29					1	131	254	106	32	8	532
30-34							73	118	45	8	244
35-39								38	44	5	87
40-UP								1	10	5	16
TOTAL	226	1500	2145	2906	2425	1662	1192	711	306	57	13130

TABLE 2

AVERAGE SALARIES OF FULL-TIME MEMBERS

COMPLETED YEARS OF SERVICE	UNDER 25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	OVER 65	TOTAL
0-4	15382	16688	18878	20283	22492	23912	25298	23097	27812	26232	19141
5-9		18481	20524	22960	24209	23010	24990	25984	23660	25487	22032
10-14			22926	24975	27023	26293	26511	26532	24868	25190	25411
15-19				26998	28744	30000	28595	27913	27796	22180	28570
20-24				29420	29495	30349	31295	29103	28557	26760	30137
25-29					24282	31889	32436	30902	27410	27772	31608
30-34							33014	32854	32838	28201	32746
35-39								31738	33422	43072	33241
40-UP								24070	30542	28151	29391
TOTAL	15382	17062	20348	23496	26476	27886	29341	29049	28972	27565	24190

TABLE 3

ANNUAL SALARIES OF FULL-TIME MEMBERS
IN THOUSANDS

COMPLETED YEARS OF SERVICE	UNDER 25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	OVER 65	TOTAL
0-4	3477	19809	14800	15151	9087	4376	2480	716	501	26	70423
5-9		5784	20134	17174	11645	5500	2749	1533	568	127	65214
10-14			8712	26449	14673	7888	4401	2335	597	227	65282
15-19				9476	22995	12630	7091	3991	1584	199	57966
20-24				29	5781	11776	7604	3696	1485	187	30558
25-29					24	4178	8239	3276	877	223	16817
30-34							2410	3877	1477	225	7989
35-39								1206	1470	216	2892
40-UP								24	305	141	470
TOTAL	3477	25593	43646	68279	64205	46348	34974	20654	8864	1571	317611

TABLE 4

NUMBER OF PART-TIME MEMBERS

COMPLETED YEARS OF SERVICE	UNDER 25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	OVER 65	TOTAL
0-4	77	358	298	302	192	104	59	27	13	7	1437
5-9		24	98	73	36	18	10	10	3		272
10-14			9	46	16	13	11	5			100
15-19				4	10	11	3	9	1		38
20-24						5	2	2	3		12
25-29											
30-34											
35-39											
40-UP											
TOTAL	77	382	405	425	254	151	85	53	20	7	1859

TABLE 5

NUMBER OF VESTED INACTIVE MEMBERS

COMPLETED YEARS OF SERVICE	UNDER 25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	OVER 65	TOTAL
0-4											
5-9		12	139	125	71	68	56	34	11	3	519
10-14			2	42	37	39	35	39	11		205
15-19				6	13	25	24	20	4		92
20-24						7	5	8		1	21
25-29							1	1			2
30-34							1	1		1	3
35-39										1	1
40-UP											
TOTAL		12	141	173	121	139	122	103	26	6	843

TABLE 6

SUMMARY OF RETIREES

NUMBER OF MEMBERS

	UNDER 54	55-59	60-64	65-69	70-74	75-79	80-84	OVER 85	TOTAL
NUMBER	226	387	732	975	930	919	599	368	5136

TOTAL BENEFIT IN THOUSANDS

	UNDER 54	55-59	60-64	65-69	70-74	75-79	80-84	OVER 85	TOTAL
TOTAL	204	332	570	638	437	338	207	131	2857

AVERAGE MONTHLY BENEFIT

	UNDER 54	55-59	60-64	65-69	70-74	75-79	80-84	OVER 85	TOTAL
AVERAGE	900	858	779	654	470	367	345	354	556

TABLE 7

SUMMARY OF DISABLED

NUMBER OF MEMBERS

	UNDER 54	55-59	60-64	65-69	70-74	75-79	80-84	OVER 85	TOTAL
NUMBER	46	29	40	46	41	15	12	6	235

TOTAL BENEFIT IN THOUSANDS

	UNDER 54	55-59	60-64	65-69	70-74	75-79	80-84	OVER 85	TOTAL
TOTAL	21	13	19	19	17	4	4	2	99

AVERAGE MONTHLY BENEFIT

	UNDER 54	55-59	60-64	65-69	70-74	75-79	80-84	OVER 85	TOTAL
AVERAGE	462	451	478	416	399	322	369	347	427

TABLE 8

SUMMARY OF SURVIVORS

NUMBER OF MEMBERS

	UNDER 54	55-59	60-64	65-69	70-74	75-79	80-84	OVER 85	TOTAL
NUMBER	123	41	40	26	31	22	13	5	301

TOTAL BENEFIT IN THOUSANDS

	UNDER 54	55-59	60-64	65-69	70-74	75-79	80-84	OVER 85	TOTAL
TOTAL	38	22	19	10	13	9	5	2	118

AVERAGE MONTHLY BENEFIT

	UNDER 54	55-59	60-64	65-69	70-74	75-79	80-84	OVER 85	TOTAL
AVERAGE	310	529	484	407	413	400	385	515	395

TABLE 9

SUMMARY OF CHILD'S BENEFIT

NUMBER OF MEMBERS

	UNDER 5	5-6	7-8	9-10	11-12	13-14	15-16	OVER 17	TOTAL
NUMBER	1	3	3	4	7	11	12	8	49

TOTAL BENEFITS

	UNDER 5	5-6	7-8	9-10	11-12	13-14	15-16	OVER 17	TOTAL
TOTAL	100	300	300	400	700	1100	1200	800	4900

AVERAGE MONTHLY BENEFIT

	UNDER 5	5-6	7-8	9-10	11-12	13-14	15-16	OVER 17	TOTAL
AVERAGE	100	100	100	100	100	100	100	100	100

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SECTION IV

ACTUARIAL FUNDING METHOD AND ASSUMPTIONS

The true cost of the Teachers' Retirement System will be determined by its future experience. In determining the financial requirement of the fund, certain assumptions were made as to the expected future experience. This section summarizes the funding method applied as well as the basic assumptions used.

Any variations in the actual experience of the fund from those assumed in this valuation may cause changes in the projected future costs of the fund. It is therefore necessary that the actuarial assumptions be reviewed from time to time with adjustments as experience warrants. It is also important that regular valuations be performed to determine the financial effect of variations between the actual and assumed experience.

The assumptions shown below were based upon the past experience of the fund together with the projections as to future experience.

FUNDING METHOD

The method of funding employed is commonly referred to as the entry age normal cost method. This method establishes a normal cost of each fund as well as an unfunded accrued liability. The normal cost is the level percentage of total salaries required to fund the benefits, assuming this percentage has been contributed since each member's entry into the fund.

The unfunded accrued liability represents the excess of the present value of total liabilities over the present assets of the fund and the present value of expected future contributions for the normal cost.

In order to maintain the fund on an actuarially sound basis, the rate of contribution should be such as to meet the normal cost in addition to making progress towards the amortization of the unfunded liability.

DISCUSSION OF ACTUARIAL ASSUMPTIONS

Mortality Rates

The 1971 Group Annuity Mortality Table ratio for males and females are applied to active members and those receiving benefits. The mortality rates were set back one year to reflect increased life expectancies.

Disability Rates

The disability rates for males and females are based upon rates published by the Railroad Retirement board.

Retirement Rates

The retirement rates are based upon the past experience of the system and projected future experience with a trend toward earlier retirements.

Withdrawal Rates

The withdrawal rates are based upon the experience of the system. Those rates represent the net effect of the experience of the system including the termination of members, the reemployment of terminated members, and the purchase of credit for past service.

Future Salaries

The rates of salary increase are based upon an underlying cost-of-living assumption of 6.5% per annum. Meritorious service and longevity increases were also taken into account.

Investment Earnings

The net investment earnings rate is assumed to be 8% compounded annually.

Admininstrative Expenses

The administrative expenses of the system are assumed to be funded by excess investment earnings.

Termination Benefits

All members terminating with less than five years of service are assumed to request an immediate withdrawal of their personal contributions with interest. Members with five or more years of service are assumed to select the benefits most advantageous to them under the given assumptions.

ILLUSTRATION OF ACTUARIAL ASSUMPTIONS

Mortality Rates

The mortality rates are based upon the 1971 Group Annuity Mortality Table with ages set back on year.

Age	Deaths Per 100,000 Male Members	Deaths Per 100,000 Female Members
25	59	33
30	76	44
35	105	61
40	151	87
45	257	129
50	474	197
55	781	298
60	1,192	490
65	1,919	861
70	3,244	1,446
75	5,122	2,863
80	7,969	5,062
85	12,112	8,150

Disability Rates

The disability rates are based upon the rates published by the Railroad Retirement Board.

Age	Disabilities per 100,000 Active Members
25	24
30	24
35	32
40	72
45	152
50	272
55	496
60	1,586

Retirement Rates

The retirement ages among members eligible to retire are based upon the actual experience of the system, and the anticipated experience from a new provision allowing members to retire with unreduced benefits after completing 25 years of creditable service. The expected annual rates of retirement among members eligible to retire are shown below:

Age	Annual Rate of Service Retirement
54 or less	20%
55-59	25
60	30
61	35
62	45
63	35
64-69	30

It is further assumed that 35% of the members will retire immediately upon becoming eligible.

Immediate retirement is assumed for members who have attained age 70 or older.

Withdrawal Rates

The withdrawal rates illustrated below reflect the turnover experienced by the Teachers' Retirement System.

Age	Annual Rate of Withdrawal
25	13.78%
30	11.45
35	9.43
40	7.55
45	5.32
50	2.95
55	1.81
60	1.33

Future Salaries

The salary increases are based upon the projected experience of the system with an underlying assumption of 6.5% for cost-of-living increases and .75% for longevity and meritorious service increases.

Investment Earnings

The annual rate of return is assumed to be 8% for future investment earnings.

Administrative Expenses

The administrative expenses are assumed to be paid from investment earnings in excess of the assumed rate of 8%.

Assets

Investments, except mortgages, are valued at amortized book value. Mortgages are valued at par value. Publicly traded securities are valued at current market values.

Premiums and discounts are amortized using the straight-line method over the life on the securities. An average life of eight years is used for amortization of mortgage discounts.

SECTION V

SUMMARY OF BENEFIT PROVISIONS

Effective Date	September 1, 1937
Vesting Period	5 years. No benefits are payable unless the member has a vested right, except the return of employee contributions with interest.
Final Compensation	Average of highest 3 consecutive years of earned compensation.
Normal Form of Benefits	Life only annuity. All benefits cease upon death; however, in no event will the member receive less than the amount of employee contributions with interest.
Normal Retirement Benefits	
Eligibility:	25 years service or age 60.
Benefit:	The retirement benefit is equal to 1/60 of final compensation for each year of service.
Early Retirement Benefits	
Eligibility:	5 years of service and age 50.
Benefit:	The retirement benefit is calculated in the same manner as described for normal retirement, but the benefit is reduced 1/2 of 1% for each of the first 60 months early and 3/10 of 1% for each of the next 60 months early.
Death Benefits	
Eligibility:	5 years of service.
Benefit:	The death benefit is equal to 1/20 of final compensation for each year of service accrued at date of death with an actuarial adjustment based on the relation of the member's age at death to the beneficiary's age. A monthly benefit of $100 is paid to each child until age 18. In addition, a lump sum benefit of $500 is paid upon the death of an active or retired member.

Disability Benefits	
Eligibility:	5 years of service.
Benefit:	The disability benefit is equal to 1/60 of final compensation for each year of service accrued at date of disability. The minimum benefit is 1/4 of the final compensation.
Withdrawal Benefits	With less than 5 years of service, the accumulated employee contributions with interest are returned. With more that 5 years, the member may elect a refund of contributions with interest, or may leave the contributions and interest and retain a vested right to retirement benefits.
Tax Sheltered Annuity	The Teachers' Retirement System sponsors a tax-deferred annuity program for the benefit of its members. The policies of this program have been established in accordance with the guidelines set by the Internal Revenue Service. The benefits provided by this program are determined solely by the value of the member's account (voluntary contributions plus interest) using actuarial tables provided by the Retirement Board.
Contributions	Employee: 7.044% of compensation Employer: 7.428% of compensation